The Beagle, Records of the Northern Territory Museum of Arts and Sciences, 1990 7(1):137-139

BOOK REVIEW

Kangaroos: Their Ecology and Management in the Sheep Rangelands of Australia.

Edited by Graeme Caughley, Neil Shepherd and Jeff Short.

Cambridge University Press, 1987
ISBN 0 521 303443, 253 pages, Hardback.

This most excellent volume is the product of a joint research project carried out by CSIRO Division of Wildlife Research and N.S.W. National Parks and Wildlife Service. The five year study examined the relationship between high kangaroo densities and vegetation in the Kinchega National Park and compared this to a nearby grazing property 'Tandou'.

The essence of this study is to examine two adjoining and similar ecosystems, both of which are grazed by red and grey kangaroos and one of which is also grazed by sheep. The product is an assessment of how kangaroos may best be managed in national parks and rangelands.

The book is subdivided into a preface and 11 chapters, an author index and a subject index. Each of these contributions is by an author or group of authors expert in that particular aspect of ecology.

Graeme Caughley's first chapter, "Introduction to the sheep rangelands", chronicles the introduction of man, his domesticated animals and his practices to Australia, and catalogues their impact on the marsupial population. The ten illustrations and single table show the main protagonists in the conflict (sheep and kangaroos), in terms of their distributions and densities, and sets the scene for what follows.

Robertson, Short and Wellard's second chapter, "The environment of the Australian sheep rangelands", then gives an overview of the sheep rangelands environment and provides a detailed assessment of the two study areas, Kinchega and Tandou. Climate, landforms, soil, vegetation and fauna are described in some detail. The chapter includes 12 figures (line drawings and photographs) and four tables of data. The impact of the introduction of sheep and rabbits, together with the effects of massive overgrazing and land management techniques are described. The resultant extinction of 32% of marsupial species in sheep rangelands is laid bare. The only minor fault which stood out in this chapter was the failure to include the European hare in the list of European mammals introduced to Australia.

Whereas the first two chapters set the scene and catalogue the effects of past events and current conditions, the third chapter, "The effect of weather and soil moisture and plant growth in the arid area", is a straight research report and is marked by a change in format to that of Introduction, Methods, Results, Discussion and Conclusion - with which we are all so familiar. Greg Wellard's study involves the analysis of two animal enclosure areas on different soil types in Kinchega (floodplain and sandplain). He attempts to determine the relationships between rainfall and soil moisture and asks if these can be used to predict changes in pasture growth biomass. The data analyses and findings are illustrated with six line drawings and five sets of tables. As we might have expected, growth was correlated with rainfall over the previous month or so and biomass was equally related to rainfall, but over a longer time period, and could be predicted. The findings were unremarkable, but the contribution undoubtedly necessary for this volume.

Robertson's fourth chapter, "Plant dynamics", returned to the less traditional format. In this study biomass and species composition were measured at several hundred sites at Kinchega and Tandou. Comparisons were made on caged and uncaged plots to measure the effects of kangaroo, sheep and rabbit grazing, trampling and dieback. Biomass and species composition were estimated. The results are illustrated with 12 figures (line drawings and photographs) and a single table. The conclusions are significant in showing that not only rainfall but grazing are determinants of plant biomass, although rainfall, or more precisely its absence, overrides all. Grazing by mammalian herbivores removed 70% of the

pasture biomass, kangaroos and sheep differed in that the latter browse blue bush heavily in drought periods.

Chapter 5 forms an interesting contrast with Chapter 4. Barker approaches "The diet of herbivores in the sheep rangelands" from a different perspective; that is, by analysing fecal, rectal and stomach samples. Three tables and six illustrations and photographs assist in presenting the data. They show that red kangaroos ate blue bush, whereas greys are not particularly fond of it, and when the grass ran out would tend to eat prickly wattle. Reds and greys tend to eat much the same things when food is abundant. It would seem that reds and sheep eat similar plants during times of stress and greys do not. Eastern and western greys also have a very different diet. The chapter is well written and presented.

In Chapter 6 Jeff Short examines "Factors affecting food intake of rangelands herbivores". He analyses grazing trials of sheep, rabbits and kangaroos. The feeding trials were at Kinchega for red and western grey kangaroos and rabbits, and utilised published data from other areas for sheep. It appears that there is minimal competition between species when biomasses are above 300 kg/ha. But lower than this and the interactions start. Food quality affects the amount of intake. Not surprisingly the rates of increases of these herbivores are constrained by food availability. Sheep, red kangaroos and rabbits, because of their grazing efficiency and predilection for seedlings, have the capacity to greatly modify rangelands and wipe out plants such as blue bush. Western grey kangaroos appear to be less efficient feeders then are reds, or for that matter sheep and rabbits.

Whereas Chapters 3 to 6 discussed the utilisation of food resources by kangaroos in Kinchega and Tandou, Chapters 7, 8 and 9 discuss their population dynamics, home range condition and reproductive condition.

In Chapter 7, "The mobility and habitat utilisation of kangaroos", David Priddel presents his results of mark - recapture - release, telemetry and habitat utilisation studies which were made on red and western grey kangaroos in both study areas. The results presented demolish some of the oft repeated furphies about the migration of hordes of kangaroos. Few kangaroos do move considerable distances, but Priddel has convincingly shown that the great majority of animals live and die within their home ranges which are less than 8 km^2. This paper is well illustrated with seven plates and figures and the data is presented in four tables. Population sample sizes are quite adequate for the conclusions reached within those study areas. Clearly, they would be expected to be larger if multiple sites were investigated.

Peter Baylis's chapter on "Kangaroo dynamics" concentrates on the use of aerial spotting to determine the relationship between the dynamics of red and western grey populations and their food supply on Kinchega, Tandou and other adjoining properties. The situation is interesting although anomalous in that reds and western greys are found in a ratio of approximately three to one in both areas, yet the population is twice as large in the national park when compared to the sheep station. Most significantly Bayliss found that the difference in density was due to sheep reducing the amount of food available for kangaroos. In terms of the ratios of the two kangaroo species, Bayliss found that if one species increased the other decreased and *vice versa*. This is well illustrated with five plates and figures and a single table.

The ninth chapter, "Conditions and recruitment of kangaroos", by Neil Shepherd is blood and guts zoology in its simplest form. Three monthly samples of red and western grey kangaroos from Kinchega and Tandou (only reds) were shot and the animals were dissected to assess body and reproductive condition. The data are presented in eight tables and five line drawings. It appears that body condition is a useful summary of a kangaroo's response to its environment. This would seem to be hardly surprising, nor is the fact that it correlated best with food supply! Naturally, all are linked with rainfall. Shepherd also found that reds and western grey kangaroos have different reproductive strategies. Reds mature earlier in good conditions and have a higher production rate. Whereas, western greys have a longer pouch life and suckle longer than reds.

Graeme Caughley synthesises the findings of this suite of studies in Chapter 10, "Ecological relationships". This large chapter of 28 pages (three tables and five figures), is subdivided into main sections on "relationships" and "what regulates kangaroo popula-

tions ?", ecological questions to be answered and a large conclusion section. It is seldom that a working ecologist has such a fine suite of contributions to utilise in an overview of two diserete study areas. Caughley does this expertly and succinctly. The elements of the system are identified (the 'pasture - biomass loop' and the 'plant-herbivore loop'), and then the behaviour of the system is described.

In the last chapter Shepherd and Caughley make an exhaustive assessment on the "Options for management of kangaroos". The approach taken is to introduce the kangaroo "problem" in a historical/legalistic mode; eventually acknowledging the fact that the kangaroo populations are often very large and a harvestable resource. They have clearly attempted to produce a balanced and unbiased account and have done so in considerable detail. Nevertheless, while providing reasonable options they appear commercially directed and a little dismissive. I found it somewhat ironic that the animal liberationists (p. 212) arguments were dismissed along with recreational hunters (p. 213). "Recreational hunters are unlikely to have much effect on numbers because most do not class kangaroos as game animals" (p. 213). I found this a little odd since the recent N.S.W. state elections demonstrated that there are a large number of recreational hunters in that state. These hunters do not normally have the legal opportunity to hunt kangaroos, a fact which makes me wonder where the authors found their information. It seems to me a true misuse of public resources to find that some 13,000 kangaroos should starve to death at Kinchega in 1983, when many could well have been harvested by recreational hunters paying a per-animal-fee. But then, since when has game management had anything to do with logic.

Caughley, Shepherd and Short have edited what is one of the most significant Australian ecological and management analyses produced. This in-depth study of one of Australia's most visible environmental issues, the kangaroo, has flattened the extremist views of pastoralists on one hand and animal liberationists on the other. It has exposed the lack of an effective management plan for Australia's most prominent animals and has given the N.S.W. Government options on which to act. This most excellent volume is a landmark study and a must for all Australian ecologists. Indeed, it should also be a necessity for all informed graziers and pastoralists.

MAX KING
Northern Territory Museum
GPO Box 4646
Darwin NT 0801, Australia.